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ROCKS and MINERALS

Vol. 4. No. 1. MARCH, 1929 Whole No. 11

Typical country in Nigeria, West Africa. A tin mining camp showing the white man's quarters and stores. The hills in the background are Gneiss.

SPECIAL ARTICLES

More About the $5,000 Dolomite.
Arsenic, Its Uses and Misuses. By Edward Cahen.
A Brief Description of the Tin Fields of Northern Nigeria, West Africa. By Aubrey E. Horn.
A Famous Hill. By C. W. Hoadley.

THE MAGAZINE FOR COLLECTORS

THE BULLETIN BOARD

NEW OFFICERS OF THE ROCKS AND MINERALS ASSOCIATION FOR 1929

The Honorary President of the Rocks and Minerals Association for 1929, Dr. Henry C. Dake of Portland, Oreg., is a noted mineral collector whose name is quite well known to our readers because of the articles he has contributed to the magazine. Dr. Dake comes into his new office with much enthusiasm and the hope of increasing the membership of the Association during the coming year.

Morrell G. Biernbaum, the first Past Honorary President of the Association, has been elected to a Vice-Presidency because the interest he has manifested has been too great to permit him to be retired into an ordinary membership or to be placed in a class by himself as a Past Honorary President. We hope in this way not to lose Mr. Biernbaum's encouragement and interest in the Association.

E. Mitchell Gunnell of Galesburg, Ill., who has contributed so many excellent articles on the phosphorescence of minerals, is a new Honorary Vice-President who takes the place of Mrs. Ilsien Nathalie Gaylord whose health will not permit her to take the active interest in the Association in 1929 which she has always manifested heretofore. (We sincerely hope that Mrs. Gaylord may soon be restored to health and strength and that she will not lose her interest in the Rocks and Minerals Association.) Mr. Gunnell is a mineralogist of note who has been an ardent supporter of the Rocks and Minerals Association since its inception.

The remaining offices for 1929 will be filled by the same officers as during 1928.

In our last issue we mentioned how ROCKS AND MINERALS had influenced two young men in taking up mining engineering as a profession—one entering the Colorado School of Mines, the other the Pennsylvania State College School of Mines. Recently we received a letter from Chester Brum of Denver, Colo., who says that he likewise is preparing to take up mining engineering and will enroll in the Colorado School of Mines—largely because of the interest the magazine has awakened in him in minerals.

It is very gratifying to receive such letters and we trust that we may receive many more of them.

Another letter that has given us great satisfaction and encouragement is printed below.

Mr. Bradley is a subscriber from the very first issue and his letter is typical of the many that we have received in which subscribers express their complete satisfaction with ROCKS AND MINERALS.

Dec. 22, 1928.

ROCKS AND MINERALS,
Peekskill, N. Y.

Gentlemen:

It is with pleasure that I enclose my check for renewal to ROCKS AND MINERALS for the coming year.

I take this opportunity to express my appreciation of your efforts to please and I assure you your efforts have been rewarded. Every issue of ROCKS AND MINERALS shows progress and is now worth more than the subscription price. Wishing you a very Merry Christmas and a happy and prosperous New Year, I am

Very truly yours,
(Signed) J. W. BRADLEY,
Secy. United Eastern Mining Co.,
Oatman, Ariz.

WANTED: Correspondents in all parts of the world who will be kind enough to send us notes and news items on minerals, etc., that they think may be interesting to the subscribers of "Rocks and Minerals." Such as are available we shall be very glad to print in the magazine.

ROCKS AND MINERALS

The Magazine for Collectors

Published Quarterly

Peter Zodac
Editor and Publisher

The Official Journal of The Rocks and Minerals Association

Vol. 4, No. 1 MARCH, 1929 Whole No. 11

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ROCKS AND MINERALS **PEEKSKILL, N. Y., U. S. A.**

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To introduce ROCKS AND MINERALS to new subscribers, we have made a special arrangement with the publishers of the *Journal of the Outdoor Life* and *The Quarry Managers Journal* whereby either one of these two magazines may be had in combination with ROCKS AND MINERALS for the attractive price of its regular subscription alone. The magazines will be sent to the address of the subscriber or the subscriber may have one or both sent to friends.

ROCKS AND MINERALS (a quarterly) is the only magazine in the country that is devoted to the fascinating study of minerals and their collecting and written in such a way that even the beginner can read and understand it. A subscription makes one a member of the Rocks and Minerals Association.

The *Journal of the Outdoor Life* (a monthly) is the only national magazine written by and for tuberculosis patients. It contains stories, verses and scientific articles written by tuberculosis specialists; conducts a Question Box and has a Nature Study Department in connection with which prizes are offered each month. Offers diversion, help and inspiration not only to tuberculosis patients but to everyone interested in health.

Subscribers to ROCKS AND MINERALS will find the Nature Study Department most interesting and instructive reading. The department is conducted by Mrs. Ilsien Nathalie Gaylord, whose very instructive articles on The Beginner's Cabinet, ran through a series of numbers of ROCKS AND MINERALS.

The *Quarry Managers Journal* is the only magazine in the world which is devoted to quarry management, written by quarry managers, edited by a quarry manager, and controlled by an Institute of Quarrying. In its pages, the men who know—practical men and experts—discuss everything directly and indirectly relating to quarry management, and its readers are consequently kept informed of the latest developments. These are the reasons why it has subscribers in every continent. The *Quarry Managers Journal* comes out monthly and is published in Birmingham, Eng.

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Name .....

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.....

.....

(NOTE—You may have the three magazines for $4.00.)

A BRIEF DESCRIPTION OF THE TIN FIELDS OF NORTHERN NIGERIA, WEST AFRICA

By Aubrey E. Horn
Assoc. Otago School of Mines, New Zealand University,
Assoc. Inst. M. M. (London).
c/o Naraguta (Nigeria) Tin Mines, Ltd., Post Office Jos.,
Bauchi Province, Northern Nigeria, West Africa.

The tin fields of Northern Nigeria are now becoming one of the big producers of the world's tin. Tin in the form of metal first attracted the attention of the then Royal Niger Company prior to 1909 by being brought down from the northern provinces as trade material by the natives. In this form as a metal it took the shape of straws about 12 inches long and was traded in bundles. The metal thus smelted by the natives of the north was exceptionally pure. The consequential expedition to discover the deposits, located after great trials the present field. Further prospecting proved that the alluvial deposits were very rich in parts and very extensive. Gradual developments and the employment of machinery in place of former primitive methods have brought the field to the front and the prominent position it now holds as a world producer.

The field is about 400 miles from the coast and is now reached by rail. Originally the route was by steamer past Lokoja on the Niger River to Baro, thence overland by trek to the Plateau.

Geology

The field may be divided roughly into three sections:

(a) The Northern Tin fields.
(b) The Plateau Tin fields.
(c) The Nassarawa Tin fields.

The first and last are at a height of about 2,000 feet above sea level, while the Plateau rises abruptly to 4,000 feet on an average. The latter is the main area of the alluvial deposits. The ore is Cassiterite. In all cases it is found that the deposits are intimately related with granite, and in a few minor places with pegmatite. These granite intrusives form the main configuration of the

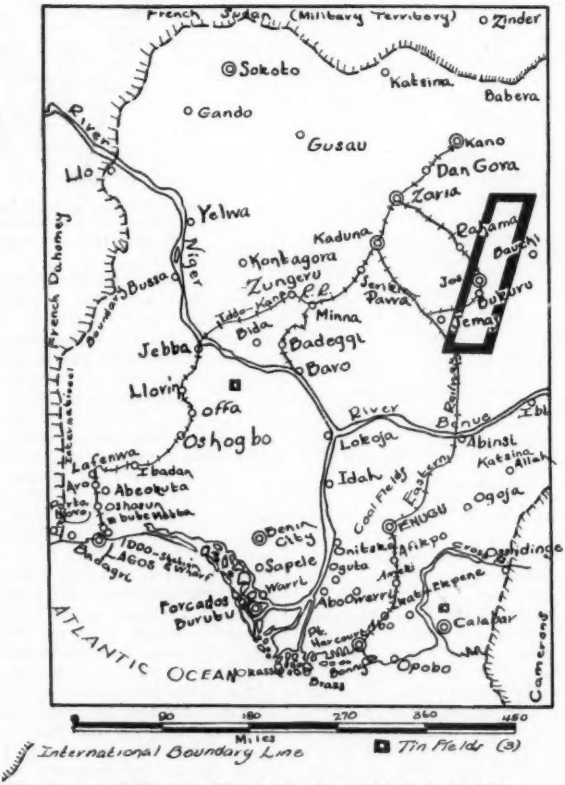
Map of Africa showing Northern Nigeria and Jos (the center of the largest tin field)

Plateau. It is considered that the granite hills which are such a feature of the plateau have been exposed by the weathering away of crystalline schists into which the original magma was at first intruded. These crystalline schists are still to be seen on exposures and often mark bedrock during drilling and pitting. The Cassiterite, hereafter referred to as tin, both for the sake of abbreviation and on account of its always being so called by the miners, is found actually in the granite in areas which have been subjected to alteration and pneumatolytic processes, but the bulk of it is not supposed to have come so much from the direct weathering of the granite bearing it as an alteration product, as from the several contacts between two types of granite known locally as the Old and the New Granites. These, as the names imply, show two periods of intrusion. It is considered that the weathering of these contacts supplied the tin which being released was then concentrated in the old river beds. Subsequently to this concentration several foci of volcanic erup-

tion occurred with the result that very large areas of the plateau as it then existed was inundated with a flow of basalt. This in many cases ran into the old beds, overflowed the flats and covered the earlier concentrated deposits. Following this volcanic disturbance a general elevation of the plateau occurred. With the surface so elevated and the levels altered, new stream beds formed, and new alluvium deposited. These younger streams, often eroded deep enough to cut into the older and original deposits, reconcentrated the contents of these latter and so formed some of the very rich ground now being worked. The old beds in themselves were in many cases extremely rich as is seen by their being worked today, both under the new alluvium and under the original sheets of basalt.

Besides these deeper leads, much tin is won from shallower deposits; from recent river beds; and from the detrital deposits close to the granite.

A feature of the country are the flat topped hills and cones, which are the remains of the original deposition processes, and are known as the Fluvio-Volcanic series, and are river and shallow-pond deposits buried under red gritty clays and the basalt sheets. Their present form is a consequence of the elevation of the plateau and they are the remains of the then surface level after it had been subjected to the torrential rains and other intense climatic condi-



Sketch map of Northern Nigeria showing position of tin fields

tions of this part of the tropics. Below is a sketch of a typical Fluvio-Volcanic.

The tops of these flat topped hills and cones are practically at the same level and are evident testimony to the immense amount of erosion that had previously taken place. They are usually capped by a "laterite," which, though not containing much alumina, is in parts almost pure limonite and clay ironstone. It is in fact so rich in iron that it is gathered by the natives and smelted for the iron content. They are often separated by miles of open plains and stand isolated. This is a brief summary of the general geology of the field.

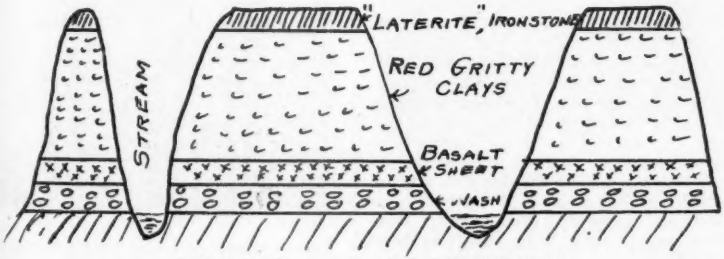
In Massarawa, and further south, below the confluence of the Benue and Niger Rivers, tin is won on a small scale by treating the much decomposed pegmatites. The Northern field presents much the same features as the Plateau without the prominence of the Fluvio-Volcanic series and the basalt flows.

Physical Features

The plateau, unlike other parts, is practically devoid of trees and even scrubs (except in Native reservations), deep gulches and forest reserves. The seasons are two, wet and dry, and the cycle of weather changes are roughly thus—the rains start in earnest about the end of May lasting till about October. Then comes a very hot spell till about the end of November which ushers in a cold dry wind causing a haze of varying intensity up till say February. The haze is caused by microscopic "motes" of dust from the Sahara Desert. From February till March the Harmattan, as this wind is called, clears and the grass fires commence which sweep over large areas and which often do considerable damage. About March the first rains occur for a day or two, and then comes a very hot spell lasting till the big rains start.

Prospecting

This is carried out both by pitting and drilling, the former method being practically abandoned during the rains. Most companies who are hindered through lack of water during the dry season for the purpose of mining take advantage of this enforced condition by entering upon a program of intensive prospecting as well as mining preparations for the next rains. Pitting is done by the natives, supervised of course by white engineers. The natives are employed either on day pay or contract. At day pay they are paid from 4s. 6d. to 6s. per week ($1.10 to $1.50), according to their skill and also age. Contractors are on a variable scale, depending on conditions of the ground and depth. As an example one scale is 3d. per foot (6 cents) to 6 feet, then 4½d. (9 cents) from 6 feet to 12 feet, and 6d. (12 cents) per foot afterwards. These figures are governed by conditions, for deep holes more is paid and if there is a lot of ground water to contend with then extra money is given. No contractor should be paid for any hole that has not reached bedrock where the ground is easy going and not more than 30 feet deep. A reliable contractor who has struck difficult ground may be paid in advance of say 2s. (50 cents) on the work done, the balance being paid on completing the pit. This is called "Chop money" and is supposed to enable him to buy his food. A contractor is very artful and will gather bedrock from



A Geological Section of a Typical Fluvio-Volcanic.

a finished pit and place it on the spoil from his own pit if he finds his pit is deep, wet, or otherwise difficult, especially if he knows the engineer is careless in examining his work. This is one of the many devices he will "try on." The pit being finished it is then sampled by taking a strip from top to bottom, either weighing or measuring its cubic contents, and from the measurement thus obtained from the sample, the value per cubic yard is easily calculated.

Drilling is usually carried out by a 4-inch Banka drill. This is an auger drill and is used with casing which is thrust down as the boring tools penetrate. A 4-inch core is thus obtained which is washed and the tin concentrate weighed, which gives the value of the ground per cubic yard when calculated with the depth bored and a certain factor for the drill of the 4 inch size.

Labor

This is drawn chiefly from the Hausas, a Mohommedan race which inhabits the Northern provinces and is perhaps the most intelligent. At any rate they are the best of a pretty poor class of labor. Pagans are used for carrying and the less skilled forms of work. Artisans, such as lorry drivers (so called "engineers"), fitters, smiths, carpenters, etc., usually come from the Coast and are Yorubas, or Gold Coast and Sierra Leone natives. Clerks are chiefly of the same class. Cooks and personal servants are drawn from all types.

Mining

The tin is won in all cases by alluvial methods, and are divided into five main classes as follows:

(1) Ground sluicing.
(2) Elevating and gravel dumping.
(3) Dredging.
(4) Underground.
(5) Tributing.

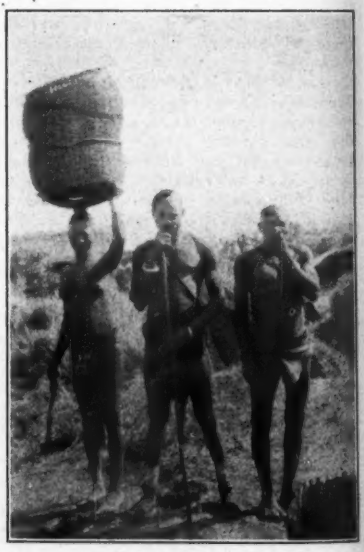
There is no lode mining of any consequence.

Where the elevation of the pay dirt is at a sufficient height above a river channel, the ground or overburden is broken by pick and face water, also by "winging" or forcing a strong current of water against the side of the deposit and thus topping the overburden into sluices, where it is helped along by miners with forks and shovels. Monitors are also employed if water with sufficient head is available.

In places where the pay dirt is below sludge channel level, and there is sufficient head of water, hydraulic elevators are used to raise the dirt into sluices. In rich ground where elevators cannot be used due to the lack of a head of water, the pay dirt is lifted out and carried to the sluices in headpans. The gravel pump is now coming largely into use and is operated by crude oil, kerosene, and steam engines. A further development in the use of machinery in Nigeria is the employment of steam shovels.

Dredging has and is being carried out in a few places, but generally with little success. It would seem that the bottom is too uneven and often huge boulders and bars are encountered. Then too the nature of the deposits themselves would work against the use of a dredge as most of the pay dirt is concentrated at the bottom with no values above in the overburden. If a dredge misses only a few inches of this wash it loses everything in that area. Where there are good values in the overburden as well or where they are fairly well distributed over all the loss of a few inches of the bottom is not such a serious matter.

In some mines where there is a great



Rukuba pagans. They have brought in charcoal to sell for the forge

deal of overburden of good standing quality or under solid basalt, the wash has been and is being won by the method of standing the ground in pillars and then systematically robbing them of the wash. In other places indiscriminated driving out of the wash has won some tin but left a great deal in, thus spoiling good areas which would have yielded high returns under proper directions.

Tributing is a system on which white men and also natives operate. The white man takes a mine or area on tribute and works it with native labor by any of the above methods or by employing native tributors as some of the companies do and which is described below.

The native tributor will work rich ground only, and usually spoils a good area by his haphazard methods of sinking pits. He reaches the pay dirt and scoops it out or drives into it from the bottom of his pit. If he is not killed by a fall he sinks another pit anywhere and so he goes on until the area is simply a mass of pits with spoil all over the ground and most of the wash left in situ, between pits. He also works the rich pockets in the rivers and detritals. His tin is bought once a week and must be up to 70 per cent metallic tin before he is paid the top price. This ranges from 3d. (6 cents) to 6d. (12 cents) per lb., usually 3d. to 4½d. (9 cents). If his tin is below 70 per cent he is paid less per lb. The quality can be judged by sight and weight after some little experience. It is usual on a new mine to test all tin brought in for a few weeks until its value can be "sensed" by appearance and weight. The most reliable test is to place a pinch of the sample on a block of zinc with hydrochloric (muriatic) acid. After a minute or two the tin is covered by a white coating of metallic tin due to the reduction of the oxide by nascent hydrogen evolved by the action of the acid on the zinc. Other minerals which are black such as Ilmenite, Magnetite, Columbite, etc., remain black under this test and are easily discerned. Another method, and one used in grading concentrates, is by an application of the specific gravity of the mixture of two substances of a known specific gravity. In this method the only impurity assumed, and which is the predominant impurity in the field, is Ilmenite. Knowing the displacement of water due to 100 grams of pure tin, and that due to 100 grams of pure Ilmenite, a table is constructed or graph made which will give the proportion of any mixture weighing 100 grams, and which lies of course between the limits of pure tin and pure Ilmenite. The specific gravity of tin and Ilmenite being known, a sample to be tested is obtained and 100 grams of it is taken. This is poured into a burette filled with water to any convenient level. The level is noted before the addition of the sample and subtracted from its new reading after the sample is added which gives the displacement of 100 grams of the sample. Thus on referring the displacement to such a table or graph, the tin content of any sample is given. The table is not greatly affected by a proportion of sand not exceeding 2 per cent. It is most important to be sure that no Columbite or Wolfram is present. These minerals are fortunately pretty well localized on the field. Doubtful high results on the burette should be checked by fire assay, cyanide or the wet method by Iodine titration. It can also be checked by hydrochloric acid and zinc. A great deal of "Tin" was shipped in the early days as such and was found to be Columbite, Ilmenite and Wolfram. Any one interested in the burette method may get further details by writing me.

Grading

All the concentrates from the field, and the lower grade tribute tin, is sized and then concentrated and cleaned in the "Willoughby." This is simply a hydraulic classifier. The tin is placed in a square box with a sieve bottom connected by a horizontal flat closed-in box to a tank of water which is closed by a valve. Upon raising the valve the water flows with a head of about five feet into

"Picking up" a river bed during the dry season, for tin concentrates

the container of concentrates through the sieve. The whole mass is agitated and on closing the valve differential settling takes place. The top is scraped of the settled concentrates and contains sand and Ilmentite and other light minerals. Depth of scraping is judged by appearance of the exposed surface. The tailings so obtained are retreated. The process is repeated until the tin is cleared. It is then dried on concrete floors or tarpaulins in the sun, or on heated hearths of sheet iron. This is the chief among a few other methods of cleaning, such as tables or sluices. Where there is heavy Columbite, Wolfram and even Ilmenite, which sometimes is hard to separate, magnetic separators are used. By cleaning up a good concentrate with the magnetic separator to a high figure some of the more difficult lower grades are able to be used up as long as the average grade of a shipment does not fall below 70 per cent. This is the figure usually aimed at in Nigeria, as transport is so expensive. In dealing with percentages of purity it is understood that the percentage stated refers to metallic tin unless otherwise stated.

Having got all our concentrates cleaned up, the next process is the mixing of the various grades in such quantity that the average will assay 70 per cent. Anything over or below this grade is either again cleaned or held over till the next week, an estimate of the bagging weight being made by reducing it to terms of 70 per cent. That weight is then placed to the credit of the week it belongs to. After the tin is all graded it is placed in doubled bags, 70 lbs. going to a bag and thus 32 bags to the long ton of 2,240 lbs. The smelters penalize at the rate of 5s. ($1.25) per ton down to about 65 per cent when the penalty increases, above 70 per cent and up to 73 per cent the smelters pay 2s. 6d. (62 cents) per ton extra. All above 73 per cent is rated as 73 per cent only. The bagged tin is then taken to the railroad mainly by a lorry but where there are no roads or a lorry, camels, and more often, donkeys carry it to the railroad. In some cases the tin is taken in by native carriers, especially the pagans who carry the bags on their heads. It is then freighted to the coast ports by rail at a cost of £12 ($60) per ton. The government imposes a royalty varying from 2 per cent on the value when tin is selling at £180 ($900) per ton to 10 per cent when the metals stands at £300 ($1,500). Smelting charges vary from £6 ($30) per ton with tin at £150 ($750) to £10 ($50) per ton when the metal is at £300 ($1,500). The total costs, including mining, transport, royalties, smelter charges, London office expenses, etc., varies from about £60 to £100 ($300 to $500) per ton.

Nigeria produces about 8,000 to 9,000 tons of tin per year and this with the advent of machinery and modern methods will gradually increase.

Claims

This paragraph should have come earlier in the text. There are three main ways of staking claims:

(a) Exclusive prospecting licenses or E. P. L.
(b) Mining leases or M. L.
(c) Mining rights or M. R.

To obtain ground a prospecting right has to be obtained. This is granted at the usual discretion of the government. It costs a private individual £65 ($325). After the expiry of one year it must be renewed. Upon leaving the country the holder will get a refund of £60 ($300). He has to pay this extra money as security that he will not become a distressed British subject and sent home at the expense of the government. A company pays £5 ($25) per license if its financial position is beyond doubt.

An exclusive prospecting license is granted for an area up to 8 square miles per area. Any sized area may be pegged if each individual area does not exceed

the limit. Thus, say 24 square miles may be pegged in 3 8-square mile blocks or 4 6-square mile blocks or any other combination in which no one area exceeds 8 square miles. The fee is £5 ($25) per square mile per year, together with survey fees averaging about £3 3s. ($15.75) per mile perimeter. The area must be renewed and applied for each year up to a maximum of three years. Under exceptional circumstances over which the owner has no control it may be renewed a fourth time. No tin must be won from this area, as the license gives the holder of the title the exclusive right to prospect it only.

A mining lease is granted for winning tin and must not exceed 800 acres per lease. The minimum term of holding is five years and the maximum twenty-one years, and under certain conditions may be renewed for a further period. The rental is 5s. (25 cents) per acre or part thereof per year.

A mining right covers a length of a maximum of one mile along the bed of a stream for a width of 200 yards. The rental is £1 ($5) per 100 yards or part thereof.

Conclusion

It may be of interest to mineralogists to note some of the minerals that occur in the field. Generally all the minerals are water-worn and so do not yield the beauty looked for by collectors. These occur as sands, rounded pieces, and in some few rare cases good crystals from detrital deposits. In my own collection I have obtained the following which will give a pretty good idea of what one can find. I am willing to exchange what I can get of these alluvial minerals with anyone who would like to have a collection of them, but I would point out that they are not very attractive from a crystallographical view. They are of interest however as minerals from the "Dark Continent."

Cassiterite: Detached crystals of bright reflecting faces, terminated by pyramids of the first and second orders.

Cassiterite: Ordinary alluvial grains, black, whitish, ruby red, and amber.

Cassiterite: In large nodules weighing up to and over one pound.

Cassiterite: Massive in vein matter.

Topaz: In perfect detached crystals from detritals, prisms, pinacoids, pyramids, domes, and basal plane.

Topaz: Singly terminated. These are rare.

Topaz: Water-worn and round. All water-white or tinged pale-blue.

Zircon: As sands, red and buff colored.

Tourmaline: Detached crystals, dulled but with many faces.

Tourmaline: In rock.

Ilmenite: Nodules and as sand.

Rutile: Nodules and as sand.

Monazite: Sand.

Columbite: With Ilmenite in sand form.

Chrome Diopside: In vitreous pieces like slag, with conchoidal fracture. Greenish in splinters, black in mass.

Pyrrhotite: Massive in Quartz. Rare.

Molybdenite: Small flakes on surface of granite. Rare.

Galena: Massive. Rare.

Fluorite: Massive. Rare.

Chalcopyrite: Massive. Rare.

Natives building houses. Grass tied into mats about 9 feet long is wrapped round a bamboo framework, and held to the frame by tying onto it with a fibre

MORE ABOUT THE $5,000 DOLOMITE

In the September, 1928, issue of ROCKS AND MINERALS, we had an article by Dr. Eles of **The de Clair Laboratories** offering a reward of $5,000 for the location of a special variety of dolomite which seemed to have unusual electrical qualities. This article was reprinted in a large number of papers and has created considerable interest among collectors and especially among the prospectors of the Western States. Such a large number of samples were sent the laboratory as to literally swamp them and so to prevent the needless sending of specimens that do not meet the required tests, Dr. Eles has been induced to give further particulars regarding the dolomite including a special test which the prospector may make himself to determine whether his dolomite would be likely to meet the requirements of the laboratory. What follows is the information forwarded us by Mr. E. M. Keinath, Secretary, who states that he hopes to induce Dr. Eles to give in a future issue of ROCKS AND MINERALS a few more notes showing the wonderful electrical test that can be developed with the dolomite in question.—The Editor.

Feb. 4, 1929.

Editor, ROCKS AND MINERALS,
Peekskill, N. Y.

Dear Sir:

Owing to the excitement that has prevailed among miners and prospectors regarding a *Special Dolomite*, **The de Clair Laboratories** takes pleasure in giving further information enabling those posted or interested in mineralogy to make their own preliminary tests.

In the first place it must be remembered that no dolomite, quartzite, or limestone need be tested or looked for other than Pre-Cambrian formation, as it seems that only this formation carries the material desired which is so sensitive to static electricity.

The dolomite may be of any color; may be mixed with impurities, but only the white or grayish-green, react in the test. In order to make this test it is necessary to have an electroscope. A suitable one may be purchased from The Palo Co,. 153 W. 23rd Street, New York, N. Y.; The Central Scientific Co., 460 E. Ohio Street, Chicago, Ill.; The Braun Corp., 363 New High Street, Los Angeles, Calif.; and The Taylor Co. of San Francisco, Calif. Priced from $5.50 to $6.50.

The de Clair Laboratories make tests with an electroscope invented by the Curries, made especially for testing mineral ores carrying radium. When desired this electroscope may be obtained from **The de Clair Laboratories** or imported directly from France.

The electroscope is charged in the usual manner with a 30-cell dry battery or it may be charged with an ebonite charging rod in use for charging electroscopes. **The de Clair Laboratories** uses an ebony rod, highly polished and free from flaws, thoroughly homogeneous throughout and protected at the handle end with a special insulator. The rod itself may be charged with fine old silk. The electroscope being clean—free from dust—is charged in a quiet room as fully as possible by means of the rod.

The mineral having been placed carefully on the charged electroscope, notice is taken of the fall of the gold leaf. If the mineral being tested is the one that is required, it will cause the gold leaf to fall rapidly taking but a few seconds only to come to rest, although the electroscope will remain charged without variation if the mineral is neutral or not wanted. There are various chemical and static reactions that were developed at the laboratory with the special dolomite but the above, however, is the principal test used by us in testing any limestone sent in.

The above static or electrical test can be made in a few minutes and is the only one that is of importance to the prospector. **The de Clair Laboratories,** in giving this information, asks the privilege of receiving samples of dolomite, limestone, quartzite, etc., having such reactions and would also request sixty days in which to further its analysis and tests. After **The de Clair Laboratories** has proven the correctness or genuineness of the dolomite, as it entails spectroscopic and chemical reactions and tests, it will at once send a party to verify the find, location, etc.

Very truly yours,
(Signed) E. M. KEINATH, *Secretary*,
The de Clair Laboratories,
713 West 8th Street,
Los Angeles, Calif.

ILVAITE AT SOUTH MOUNTAIN, IDAHO

By Dr. H. C. Dake
Honorary President, Rocks and Minerals Association

The ilvaite found at the Galconda Mine, South Mountain Mining District, Owyhee County, Idaho, is said to be equal to the best known from any locality in the world. This mining district is located in the extreme southwest corner of the State and can best be reached via Jordan Valley, Oregon. The Galconda Mine, which has been idle for many years, is at an elevation of nearly seven thousand feet but can be readily reached by auto over a fair road. Specimens of ilvaite consisting of masses of large intergrown crystals were found on the dumps of the Galconda Mine. Some of the textbooks list this material as coming from the "South Mountain Mine" which is an evident error, as ilvaite has only been found at the above mentioned mine.

The country rock in this region consists largely of fine-grained granodiorite and the ilvaite occurs in contact metamorphic deposits with limestone. The specimens of ilvaite are chiefly imperfectly crystallized black masses, being unterminated, but having good striated prismatic planes. The crystals are in a matrix of quartz, calcite, hedenbergite and diopside. A small number of good loose crystals were found in the early surface workings of the mine and were no doubt the result of natural weathering. The ilvaite crystals vary in size from small grains to prisms four inches long by two inches in diameter. The best developed ones occur in the crystalline limestone, having grown at the expense of the calcite. The lime-iron pyroxene, hedenbergite, is found associated with the ilvaite.

Ilvaite found here has a bright vitreous luster, black in color, a hardness of nearly 6 and is quite fragile due to the presence of many minute fractures which can be readily noted on the polished surface. The mineral resembles black tourmaline crystals and at first glance may be mistaken for that mineral. Ilvaite also bears a resemblance to black hornblende crystals, both often having similar striations on the prismatic planes. Ilvaite is rather difficultly fusible and yields a black magnetic bead. On the polished surface under the microscope, ilvaite bears a close physical resemblance to chromite and both are negative to all reactions.

DO YOU KNOW WHERE THESE MEMBERS ARE?

Mail is returned from the address given.

If any of our readers can inform us as to the post office addresses of members listed below we will greatly appreciate it. They have evidently moved without notifying us of their new addresses.

E. D. Marshall, 752 N. Kings Road, Los Angeles, Calif.

R. Norris Shreve, Box 224, Sta. C, Los Angeles, Calif.

E. Carson, 35 East 7th Street, Los Angeles, Calif.

John Curran, 6927 Harford Road, Baltimore, Md.

A FAMOUS HILL

By C. W. Hoadley
Englewood, N. J.

It seems hardly necessary to introduce Montreal to the readers of Rocks and Minerals as it has become the Mecca for Americans since the passage of the Eighteenth Amendment. Unfortunately few of our countrymen visit that city for the purpose of studying geology. In fact, they care very little about the history of Montreal and its immediate vicinity.

The history and geological formation of Montreal are far too interesting to be passed by without a few words of comment. The city is situated on an island about thirty-odd miles long, surrounded by the St. Lawrence River on the south and the Riviere des Prairie on the north, at the intersection of the Ottawa River.

In 1535 Jacques Cartier sailed up the St. Lawrence River and discovered the Indian village of Hochelaga, situated at the foot of Mount Royal, which he named "Ville Marie de Montreal," located approximately in the center of the island.

It was not until 1642, however, that the first settlement of French people was permanently established by Paul de Chomedy, Sieur de Maisonneuve, for the Compagnie de Montreal, whose principle object was trading with the Indians for furs—brought from the unexplored regions of the north woods, down the Ottawa River.

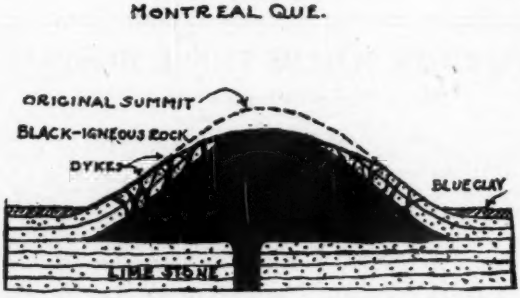
This sketch is largely about Mount Royal, or Mont Réal, from which the city of Montreal derived its name.

Mount Royal is about 900 feet elevation from sea level and is one of a chain of similar hills arising abruptly from the St. Lawrence plains which are of the same formation, penetrating the Ordovician limestone of the second Paleozoic period.

In reality, this hill, like its neighbors, is of volcanic origin, formed by a pipe or lacolith of igneous rock which has mushroomed out at the summit under the limestone crust, as shown by the accompanying sketch.

The limestone, however, has been removed from the summit by the action of the ice sheet, and by erosion, so that the actual summit today of Mount Royal is bare of limestone. The black igneous rock (camptonite) has penetrated the limestone branching from the central mass with dykes of varying thickness like the branches of a tree; from an inch, to many feet in width.

It is along these dykes where a number of interesting minerals have been found. When the writer visited the "Corpora-



Geological section through Mount Royal

tion Quarry" at the northeast corner of the mountain, interesting pyrites were noted, showing pyritohedrons, cube-octahedrons and octahedrons with pyritohedral modification.

Native arsenic was also found here a number of years ago, and beautiful calcites of many types were found when the Canadian Northern Railway tunnel was built under Mount Royal.

When the reservoir at the rear of McGill University was built, dawsonite was found in a feldspathic dyke. This rare mineral, a basic carbonate of aluminum and sodium, occurred in incrustations of white radiating bladed crystals. In only one other locality is this reported—Siena, Tuscany, Italy.

The visitor from the States, whose object is not solely to investigate the Quebec liquor laws, admirable though they may be, should take a trip to the summit of Mount Royal for the remarkable panorama of Montreal, the St. Lawrence River, and the surrounding towns and villages; each with its imposing church and convent.

For those who do not care to climb the steep ascent of 350 or more steps, horse-drawn victorias can be chartered. The French-Canadian drivers take great pride in pointing out the interesting sights of the city, including museums, churches, convents, and breweries, which are exceedingly numerous. But it is advisable to make a bargain with the pilot of such a vehicle before embarking on the voyage of sight-seeing, otherwise there may be trouble at the end of the trip.

The McGill University, situated at the foot of Mount Royal, has a fine collection of minerals, found in the vicinity of Montreal, besides a very complete general collection which is under the care of Professor Richard Graham, in the Mining and Chemistry Building. The writer wishes to take this opportunity to thank Professor Graham for the kindnesses he extended on many occasions when visiting the collection at the university.

MINERAL PRODUCTION OF THE UNITED STATES IN 1928

The total value of mineral production in the United States in 1928 was approximately $5,400,000,000, as estimated by the United States Bureau of Mines, Department of Commerce. This is a decrease of approximately 2 per cent of the total value of mineral products in 1927 and is due almost entirely to a decrease in the total value of mineral fuels. Of these, the quantity and value of coal decreased; the quantity of petroleum produced changed little, but the value decreased, and the quantity and value of natural gas and natural gasoline increased as compared with 1927. The total value of metallic products shows an increase due to increase in quantity and unit value of copper and an increase in the quantity of iron produced. Decreases were shown for gold, silver, lead and zinc. The total value of non-metallic mineral products shows approximately no change. Decreases for some of these products were offset by increases for others.

The following figures give the estimated total value of metallic mineral products and non-metallic mineral products other than fuels and of mineral fuels produced in the United States in 1928.

Estimated Value of Mineral Products of the United States in 1928

Metallic	$1,260,000,000
Non-metallic (other than fuels)	1,240,000,000
Mineral fuels	2,900,000,000
Total	$5,400,000,000

These estimates are subject to revision and replacement by precise figures as soon as the Bureau of Mines can complete the canvass of mineral industries just begun to obtain accurate statistics for the year 1928. In this canvass the Bureau is sending to every mining, quarrying, and well operating company an inquiry soliciting a report on the output of each mineral commodity by each producing establishment. Early success in this undertaking is dependent upon the continuation of the prompt and cordial response on the part of the mining companies which has been the basis of success in this statistical endeavor through many years.

ARSENIC, ITS USES AND MISUSES

By Edward Cahen, A.R.Sc., F.I.C., F.C.S.
(Author of *"The Mineralogy of the Rarer Metals"*)

Notwithstanding the extraordinary interest displayed by the newspaper-reading public in a murder drama in which arsenic has been used; it is strange to note the general haziness prevalent even among the more enlightened as to what arsenic is, where it comes from, and how it is made. This is all the more curious when one considers the great number of years this element has been known to mankind. In the literature of the past we find the same interest taken in arsenic as is the case with us today. There is plenty of evidence that arsenic was known to the ancients, but most likely only in its combinations with sulphur—in the form of the two naturally occurring minerals, realgar and orpiment. This latter mineral they called *auri pigmentum* in reference to its golden color, and there is an amusing tale told us by Pliny who says that the Emperor Caligula tried to extract gold from it, but without success. White arsenic, of which we shall have a good deal more to say later, was first distinctly mentioned by Olympiodorus, in the fifth century, and he actually gives a recipe how this substance may be prepared. The later alchemists were quite familiar with both red and white arsenic and made use of the latter to alloy with copper finding that by so doing they were able to turn this metal white, thereby thinking they had transmuted it into silver. It was for this reason, no doubt, that confusion arose in their minds between arsenic and mercury (quicksilver) for this latter metal, to which they gave the same name as red arsenic, amalgamates with copper, giving it a fine, if somewhat fleeting, silvery appearance.

If we now turn for a moment to Agricola's "De Re Metallica," in the wonderful English translation given us by H. C. and L. H. Hoover, and published by the *Mining Magazine* of London, we shall see just exactly how much was known about arsenic in the year 1556, when the first Latin edition of the book appeared. In the introduction to this work, Agricola, who was a German metallurgist and miner—his real name was Bauer (peasant)—has a few words to say about the early alchemists. He points out very aptly how none of them ever became rich through their much vaunted transmutations. In another work of his "Bermannus," there is a dialogue bearing directly on our subject:

Ancon — Avicenna also has a white variety.

Bermannus—I cannot at all believe in a mineral of a white color; perhaps he was thinking of an artificial product; there are two which the alchemists make, one yellow and the other white, and they are accounted the most powerful poisons today, and are called only by the name arsenicum.

It is this arsenicum, the white variety, which is manufactured by the ton today and from it are obtained practically all the arsenical preparations which are used in commerce and medicine.

The Manufacture of White Arsenic

The first thing that strikes one about the manufacture of arsenic is the close similarity in the methods still employed to those described by Agricola in his book. Then as now arsenic was more or less of a by-product, obtained during the

Fig. 1—General view of an arsenic works

roasting of ores to render them suitable for some other smelting operation by which a metal could be won. Arsenic, with one exception, is a dreaded impurity in other metals, for a very small quantity of it is capable of imparting very undesirable properties to them. This one exception is in the making of lead shot, where a small quantity of arsenic is added to the lead to make it harder and to facilitate the formation of spherical globules. It is, therefore, a great blessing to the smelter that it can be gotten rid of so easily by roasting, with plenty of air to combine with the arsenic which passes away to the flues as the oxide, known in commerce as white arsenic, or often simply, though inaccurately, as arsenic.

In Agricola's time the ores were roasted and the fumes allowed to pass into an upper chamber, where the heavier vapors condensed before the smoke and lighter gases passed out of the chimney on top. Cornwall, in England, has deservedly held a very high reputation for the purest arsenic since very early times and it is here that much of this poisonous material is produced to this day. So pure indeed is the Cornish arsenic that it is difficult to find any difference between it and the assay samples put up in small bottles by German firms of great renown. The form of furnace used in Cornwall today is one that has been used for many a long year and is said to be by far the most effective, though some works prefer a furnace of the ordinary reverberatory type. A large circular hearth is kept gently rotating as the material is heated by means of a fire beneath. The material containing the arsenic is fed in through a hopper at the top, and the arsenic burner is able to watch the process through a small door at the side. The strongly fuming mass is mechanically raked during the process, the ash or "rinkle" falling off at the edges of the furnace floor into a pit beneath. All the time the arsenic passes to the chambers connected with the calciner, as this type of furnace is called, by means of a flue. The arsenic, for the most part, deposits in the chambers in the form of "soot," the sulphur and other furnace gases passing on through long flues, which trap the last of the arsenic, before the gases are allowed to pass into the air of the countryside from the top of the stack which supplies the necessary draft.

Sources of Arsenic

Most of the arsenic in Cornwall is obtained from arsenical pyrites known to mineralogists as arsenopyrite or mispickel, but locally called mundic. This mundic often occurs intimately mixed with the Cornish tin and copper ores, and it is in the roasting of these ores before the metal can be smelted that most of the arsenical soot is obtained and sold to refiners.

Another source of mundic is the dumps, which so disfigure the country all over Cornwall, and across the border into Devonshire. These dumps or "burrows" are the rubbish heaps left by the tin and copper miners of old. The undaunted Cornish miner of today tries to get a living out of the waste of the past—like some beggar picking over the rubbish bins of a great city. A pretty bare living it is too but then mining operations have long ceased to be a lucrative business in Cornwall. The photograph (Fig. 2) gives an idea of a small undertaking on the banks of the Tavy where mundic is being extracted from the burrows seen in the background. The ore is reduced

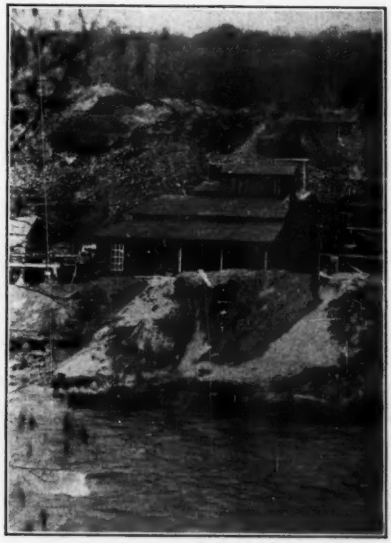


Fig. 2—A typical small works where the mundic or arsenical pyrites is extracted and concentrated from the dumps (seen in the background)

to powder in the "stamps" at the top of the works and passes on to a "James Table" (Fig. 3) where the mundic is separated from the detritus by a process in which use is made of the high specific gravity (over 6) of the mundic, the lighter particles being washed away by water flowing over the table which is kept gently jigging.

The Chambers

The chambers in which the arsenical soot collects are small vaulted rooms of brick connected one with another in such a way that the opening from one chamber to the next is placed at opposite corners. In this manner the gases containing the arsenic are made to zig-zag in their onward courses, continually striking against a cool brick wall where they deposit the arsenic before passing on.

At the sides of such a "set," as a series of chambers is called, are the doors which are opened when it is judged sufficient soot has been deposited; the flue gases in the meantime are either diverted to another set or the fire is drawn from the furnace.

The soot removed from the chambers varies greatly in color and composition, according to the efficiency of the method employed for its recovery from the raw material. It is either pale gray or quite black in color and assays anywhere from 70 per cent to over 90 per cent of white arsenic. The soot is then taken to the "refiner," a furnace of similar design to the calciner but fired with smokeless coal so as not to contaminate the product which should be pure white. The soot is slowly heated with plenty of air and the arsenic again sublimes, the vapor passing off into another set of chambers kept for this purpose. When these chambers are opened (Fig. 4) a very pretty sight presents itself to the spectator. Each chamber is covered, roof, floor and walls, with myriads of tiny glistening white crystals, for all the world like some fairy snow grotto. The crystals of which the photograph (Fig. 5) shows some very remarkable specimens, are practically pure white arsenic averaging well over 99.5 per cent arsenic oxide (As_2O_3).

Milling White Arsenic

These crystals, however, do not find their way to the market before they have been milled. For this purpose very simple mills are employed. One might almost term them primitive. They differ in no way from a mill shown in a wood-cut in Agricolla's book, a wood-cut, be it remembered, that was made in 1556—373 years ago. Fed through a hopper at the top, the arsenic passes between the rotating stones and is collected in barrels below. The mills are usually actuated by an engine but the writer has seen one operated by means of a water wheel, just as in the wood-cut referred to above.

White arsenic is sometimes purified by heating it in closed iron pots with a conical cap in which the arsenic collects in the form of a fine transparent glass, which, however, soon becomes opaque

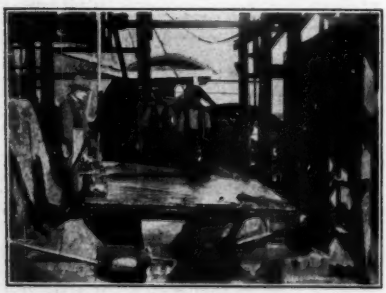


Fig. 3—A "James Table" on which the mundic or arsenical pyrites is concentrated after crushing in the stamps

Fig. 4—A Cornish arsenic worker cleaning out the white arsenic at one of the chamber doors. Note the partition wall between two adjacent chambers

on exposure to air. This method is often resorted to in Germany, Agricolla's native country, where arsenic has also been produced from the earliest times.

The Uses of Arsenic

Arsenic is manufactured, as I have said, by the ton and hundreds of tons are produced in England alone each year. The question at once arises, where does all this most poisonous material go and for what useful and legitimate purpose is it employed?

In nearly every case in which arsenic is utilized in commerce it is used as a poison. The farmer invokes its aid in the form of sheep-dips, into the composition of which arsenic enters to the extent of over 20 per cent of the dry powder. Then there is the fruit grower who sprays his trees with arsenate of lead, a compound insoluble in water and made from arsenic acid and a salt of lead. The arsenic acid is made from white arsenic acid in a special plant designed for this purpose. In America, whole orchards have been sprayed with arsenate of lead from an aeroplane. The tidy gardener, not liking to see his paths green with weeds finds a remedy in liberally sprinkling them with this deadly poison in the form of "weed-killer." We must not forget the domestic fly-papers which the cleanly housewife hangs up in her kitchen to catch and kill those dangerous carriers of disease and putrefaction, the common houseflies. Ranchmen in Argentina and other large meat-producing countries, rid their beasts of the deadly parasites which cause such havoc among their herds by spraying them from end to end with a disinfectant fluid containing arsenic. The tanner in the East has long used a mixture of orpiment and slack lime to remove the hairs from the skins. Though the depilatory action is probably not actually due to the arsenic this no doubt helps to preserve the hides. Lastly, the medical man has sought the aid of arsenic to kill the protozoal parasite to which one of the worst scourges of mankind is due, poisoning it with an organic compound of arsenic which is injected intravenously. Very remarkable success has attended the use of these compounds which were discovered after much painstaking research by Professor Ehrlich in Germany. It is related how Ehrlich examined the properties of 605 compounds before he discovered salvar-san and it is on this account that this drug often goes by the name "606." These organic arsenic compounds are also successfully used in the treatment of that dreaded tropical disease known as "sleeping sickness."

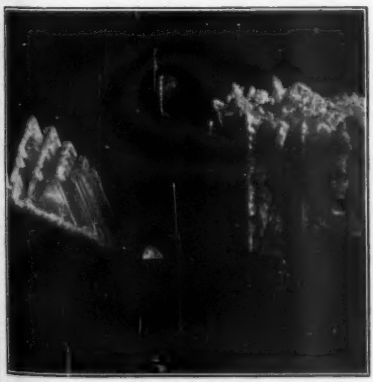


Fig. 5—Some beautiful crystals of white arsenic taken from the chambers

Arsenic is, however, not always made use of on account of its poisonous properties; there are, in fact, instances where its use has been discontinued on this very account as in the various pigments such as emerald green, Paris green, and Scheele's green, which were formerly much used in dyeing wall-papers and in the artificial flower industry where the green was dusted on to the leaves. Since the danger arising from them has been discovered their use has been practically discontinued.

Artificial realgar or Ruby Sulphur, to give it its trade name, made a good color and orpiment was used for yellow pigment till the harmless chrome yellow took its place. Ruby Sulphur still finds a limited use in the making of "Indian Fire," for, when mixed with nitre, it burns with a very intense light.

Arsenic as a Poison

As a poison, arsenic presents many interesting features. In a recent case in the British Courts of Justice, a man was being tried for the murder of his wife by administering arsenic to her. It transpired that the prisoner had purchased two ounces of white arsenic for the otsensible purpose of poisoning rats. This amount was declared by counsel to be sufficient for some 500 fatal doses. To give the reader some idea of what a fatal dose looks like the illustration (Fig. 6) has been made. Here we see a fatal dose of two grains piled up on a coin about half the size of a cent and placed next to a hen's egg and a lump of glassy arsenic. This lump weighs exactly eight ounces and is consequently sufficient to dispose of 1,750 people. This illustration should, I think, convince the skeptical what a very deadly poison arsenic is, and indicates how necessary it should be to make the laws governing its sale more stringent than they are. When it is realized that arsenic is actually a preservative and always remains, to a greater or less extent, in the human body when once it has been introduced there, it is astonishing how frequently this poison is chosen by criminals with the practical certainty of their crime being sooner or later brought to their door; it must be remembered also that arsenic is one of the easiest poisons to detect, even in very small amounts, with absolute certainty.

Fig. 6—On the right is a fatal dose of white arsenic, which may be compared with a hen's egg for size. On the left is a lump of glassy arsenic capable of fatally poisoning 1,750 people

Another peculiarity of arsenic as a poison is the large quantity of it that can be taken without fatal results. Starting with very small doses, and gradually increasing the amount, it is possible to acquire a certain immunity to the poison. In this connection no article on arsenic would be complete without some mention of the Styrian arsenic eaters of whom everyone must have heard. It is related on good authority, and the late Sir Henry Roscoe has written a paper on the subject, how these sturdy peasants will take as much as four grains followed the next day by a further dose of five grains without any fatal results. There appears to be a prevalent superstition among them that the habit of arsenic eating enables them to bear heavy burdens in the mountains without fatigue. The practice, needless to say, is carried out in secrecy.

A good deal of discussion has always been rife about the dangers incurred by those working with arsenic. It certainly does strike the stranger as a somewhat risky, not to say dangerous proceeding, to see a man walking about in arsenic as if it were snow, shoveling it up (See Fig. 4) and wheeling it away to the mill to be ground. But, on the whole, the workers are pretty careful to keep their nostrils plugged with cotton or wool and a handkerchief tied across their mouths to prevent the dry powder being inhaled. Generally speaking, the greater number of workers are quite healthy individuals who seem to thrive at their occupation. It is true that some few with delicate skins cannot work with arsenic without incurring nasty eruptions which can easily develop into very unpleasant sores that are difficult to heal. The arsenic workers are subject to respiratory troubles, but this is due not so much to the arsenic as to such gases as sulphur dioxide accidently inhaled. This "smeech," as the furnace man calls it, is more or less unavoidable but could be easily warded off could the men be induced to wear suitable respirators. It is always difficult to persuade workmen to make use of such protection, as they appear to prefer a none-too-clean handkerchief tied across the nose and mouth, as their fathers did before them.

A COMPILATION OF GEM NAMES

By Gilbert Hart

P. O. Box 2005, Birmingham, Ala.

Mr. Hart and Rocks and Minerals will be glad to have readers send in additional gem stone names not here included or suggestions as to any corrections in names which they believe should be made.

This is a continuation of the very interesting compilation of gem names (the largest ever printed) made by Mr. Hart, the first installment of which appeared in the December, 1927, issue of the magazine. This list will be continued until completed.—The Editor.

THANKS

During December we received a suite of some 35 specimens of gem material from Mr. S. W. Denton, of Wellesley, Mass. These very interesting stones were all of the opaque type, being various kinds of rocks and jasperoid quartz in the main. They are unusual in gem use and illustrate the great variety of colors obtainable in rocks and the rare combinations of varied shapes and forms of the porphyritic and banded stones. All were new to the writer, but have been used for several years by Mr. Denton.

Any other reader with specimens of gems not listed in our Gem Names Compilation is invited to send them to this department so that the list may be made as complete as possible through an appendix which is planned to follow the main list.

Fairy Stone—staurolite, twinned to form a cross.

"False"—a term which indicates an inferior stone possessing the color but not the fire of a more precious one. Applied especially to fluorite.

False Amethyst—fluorite, purple.

False Chrysolite—moldavite.

False Diamond—quartz, rock crystal.

False Emerald—fluorite, green.

False Hyacinth—grossularite.

False Lapis—quartz, agate or jasper artificially stained blue.

False Lapis Lazuli—lazulite.

False Ruby—fluorite, red.

False Sapphire—fluorite, blue.

False Topaz—quartz, yellow; (2) fluorite, yellow.

"Fancy"—term applied to stones with other than intrinsic value.

Fancy Agate—agate, one showing delicate markings and intricate patterns.

Fancy Stone—any unusual stone.

Fashoda Garnet—pyrope, dark brownish red.

Feldspar—a group of silicate minerals, monoclinic or triclinic; usual hardness 6 to 6.5, specific gravity 2.5 to 2.8; color usually pale; silicates of aluminum with usually an alkali or alkaline earth gem varieties.

Albite, Andesine, Anorthite, Bemiscite, Cassinite, Ceylon Opal, Cryptoperthite, Delawarite, Feldspar Sunstone, Felspar, Fish Eye, Labradorite, Microcline, Microperthite, Oligoclase, Orthoclase, Perthite, Plagioclase.

Felspar—English way of spelling **Feldspar.**

Feldspar Sunstone—see sunstone.

Female Sapphire—corundum, light colored sapphire.

"Feminine"—applied to the paler colored stones, Masculine refers to darker and richer colors.

Fergusonite: tetragonal, usually massive, brown; hardness 5.5 to 6, specific gravity 5.84; niobate of yttrium.

Fibrolite—sillimanite.

Figure Stone—agalmatolite.
Fiorite—opal from hot springs.
Fire Agate—imitation gold stone.
Fire Marble—dark brown shell marble with brilliant fire-like internal reflections.
Fire Opal—opal, red to yellowish red.
First Pye—diamond, faint greenish tint.
First Water—diamond, pure, colorless.
Fish Eye—feldspar, moonstone.
Fish Eye Stone—apophyllite.
Flash Opal—opal, colors showing as a single flash.
Fleches d'Amour—quartz, sagenitic.
Fleurus Diamond—quartz, rock crystal.
Flinders Diamond—topaz, from Tasmania.
Flint—quartz, compact and probably cryptocrystalline, opaque.
Floating Light — chrysoberyl, cymophane.
Flos Ferri — aragonite, shaped like coral.
Flowers of Iron — aragonite, see flos ferri.
Flower Stone—chalcedony, beach pebbles with flowery patterns due to dentritic inclusions.
Fluorite — isometric, usually in cubes; colors varied; hardness 4, specific gravity 3.2; fluoride of calcium; gem names: **Antozone, Blue John, Chlorophane, Crimson Night Stone, Cobra Stone, Derby Spar, Derbyshire, Blue John, Derbyshire Spar, False Amethyst, False Emerald, False Ruby, False Sapphire, False Topaz, Fluorspar, Pyroemerald, Rose Fluor.**
Fluorspar—fluorite.
Fool's Gold—pyrite.
Forcherite—opal, orange-yellow, color due to orpiment.
Fortification Agate—quartz agate variety, parallel zig-zag lines.
Fossil—true organic fossils are occasionally mounted as novelties, especially small trilobites; (2) resemblances of silicified materials are indicated in the term when applied to quartz gems.
Fossil Coral—quartz, see beekite.
Fossil Pineapple—opal, pseudomorph after glauberite rosettes.
Fossil Turquoise—bone turquoise.
Fowlerite — rhodonite which contains zinc, pink.
Francolite—apatite, small stalactites of minute curving crystals.
Franklinite — member of the spinel group of oxides; isometric, octahedral to massive; black to brown; hardness 6, specific gravity 5.15; double oxide of iron and manganese.
Frost Stone — chalcedony, translucent, gray with pure white patches resembling snowflakes.
Fuchsite—usually considered as a chromium-rich variety of muscovite of bright emerald-green color.
Gadolinite: monoclinic, massive, green to black; hardness 6.5 to 7, specific gravity 4.5; silicate of beryllium, iron and yttrium.
Gahnite: member of spinel group of oxides; isometric, octahedrons or massive; hardness 7.5 to 8, specific gravity 4.5; double oxide of zinc and aluminum; gem variety, **Automolite.**
Garnet—group of silicate minerals; isometric, habit trapezohedron; hardness 6.5 to 7.5, specific gravity usually high; silicates of iron, aluminum, calcium, magnesium, etc.; following are gem varieties: **Almandite, Andradite, Grenat, Grossularite, Guarnaccino, Pyrope, Spessartite, Uvarovite, White Jade, Wiluite.**
Garnierite — amorphous and massive; various shades of green; soft, specific gravity 2.55; hydrous silicate of magnesium and nickel.
Gem—a cut or polished precious stone for use as a personal adornment.
Gem Stone—a class name for all minerals which are suitable for use as gems, and sometimes extended to include ornamental minerals or rocks as well as those used for personal adornment.
Geneva Ruby—synthetic ruby, made in Geneva Switzerland.
Geyserite—a siliceous deposit of geysers, usually of opaline silica.
Ghost Quartz—quartz, rock crystal variety, transparent crystals showing an internal kernal due to a deposit on the growing crystal.
Gibralter Stone — calcite or aragonite, banded, mottled or clouded.
Girasol — corundum, cat's eye variety yielding a bluish, reddish or yellowish reflection of light of lighter shade than the stone; (2) opal, see girasol opal; (3) feldspar, moonstone variety.
Girasol Opal—fire-opal.

Glass—an artificial non-crystalline substance containing silica and several bases; (2) applied to similar natural substances, especially volcanic lavas possessing a glassy base, or wholly glassy.

Glass Agate—obsidian.

Glauberite—monoclinic, prismatic; colorless; hardness 2.5 to 3, specific gravity 2.75; double sulphate of calcium and sodium.

Glaucolite—wernerite, pale blue to gray.

Goethite — orthorhombic, acicular prisms, or botryoidal, brown; hardness 5 to 5.5, specific gravity 4.3; hydrous iron oxide.

Golconda Diamond — diamond, from the Krishna and Godavari River districts, polished and sold in the mart at Golconda.

Gold — metallic gold found native is often used in the gem trade as natural nuggets mounted in ring or pin; also as finely disseminated particles in gold-quartz.

Gold Opal—opal, shows yellow light over large areas.

Gold Quartz—quartz, massive with disseminated particles of native gold.

Gold Stone — quartz, aventurine; (2) brass or other metal filings scattered in an artificial glass.

Golden Beryl—beryl, clear bright yellow.

Golden Sapphire—corundum, golden.

Golden Stone—olivene, greenish yellow.

Golden Topaz—topaz, golden-yellow; (2) quartz, citrine variety, golden yellow.

Gooseberry Stone—grossularite, brownish green.

Goshenite — beryl, colorless through pale bluish.

Goutte d'Eau—topaz, colorless.

Goutte de Sang—spinel, blood red.

Graphic Granite — pegmatite in which the quartz and feldspar crystals are arranged in a pattern to simulate writing.

Greasy Quartz — quartz with greasy luster, usually milky white.

Green Agate—zonochlorite variety of prehnite.

Green Feldspar—microcline, amazonstone.

Green Garnet—any green garnet; (2) green enstatite from South Africa.

Greenovite—titanite, rose-red.

Green Sapphire—corundum, green.

Green Star Stone — prehnite, chlorastrolite.

Greenstone — common field name for many greenish igneous and metamorphic rocks; (1) prehnite, zonochlorite or chlorastrolite; (2) vesuvianite, variety californite.

Grenate — German name for garnet, often applied to Bohemian garnets.

Grossularite—member of garnet group of silicates; isometric, duodecahedron; red or yellow; hardness 6.5 to 7.5, specific gravity 3.66; silicate of calcium and aluminum; gem names: **Bobrowska Garnet, Ceylon Hyacinth, Cinnamonite, Cinnamon Stone, Demantoid, Essonite, False Hyacinth, Hessonite, Gooseberry Stone, Hyacinth, Jacinth, Romanzovite, Siberian Chrysolite, Succinite, Uralian Emerald.**

Guarnaccino—garnet, yellowish red.

Gummite — an alteration product of pitchblende, amorphous, used only as a gem because of its radium content and rarity.

Gypsum—orthorhomic, massive or prismatic, pale to colorless; hardness 2, specific gravity 2.32; hydrous sulphate of calcium; varieties used as ornamental stones are: **Alabaster, Derbyshire Spar, Moonstone, Ocean Spray, Patrick, Satin Spar, Selenite.**

"GOLD RUSH" IN CITY STREET

The January, 1929, issue of *National Jeweler* carried an interesting little account of a gold rush in a Western city. A gold nugget, turned up by a workman's shovel at Washington Street and First Avenue South, Seattle, Wash., just before Christmas, caused a miniature "gold rush" to hold up the usual progress of Christmas shoppers. A crowd of unemployed, seeing the find, thronged to the spot and in a mad scramble unearthed from the muddy excavation more nuggets, gold chains, coins, South American currency, lockets, rings, necklaces and brooches. It is supposed that the treasure was lost by patrons of the old "M. & N." saloon and gambling house, a mecca of returning prospectors during the Klondike gold rush three decades ago, and that, having slipped down through cracks in the floor, had been buried in the mud underneath.

THE GEM DEPARTMENT

Conducted by
GILBERT HART

Each issue Mr. Hart will give in this department information concerning gems and gem minerals. As Mr. Hart invites correspondence relating to the department, letters should be addressed to him as follows:

Gilbert Hart, P. O. Box 2005, Birmingham, Ala.

IOLITE

One of the rarer gems, rare both in occurrence of suitable specimens and in use by the lapidary, is the clear blue iolite, the "sapphire d'eau" of fifty years ago when French names were preferred to English. We call it water-sapphire probably because its dichroism in blue, green, and yellow is suggestive of the varied aspects of the ocean, although the true reason for the name is lost.

Iolite, or cordierite, as known to European mineralogists, is rather common as a mineral, usually being found in crystalline rocks as a product of recrystallization through the agencies of heat and pressure. It is present in small grains and crystals which often show many inclusions of other minerals normally found in the same rocks; even fluid inclusions are noted with bubbles of air enclosed within the mineral. Such specimens are usually too small and imperfect for gem use, but to the prospector are indications of other gems such as garnet, spodumene and corundum.

It is also found in some volcanic rocks, rhyolite and andesite in particular, and here develops its purest and largest crystals. Where such rocks have been eroded, iolite is found in the stream gravels, and practically all gem specimens have come from such placer deposits. Only the purest material can long survive the abrasive and solvent action of the streams since iolite is easily cleaved and very easily decomposed.

The crystals belong to the orthorhombic system, and usually look very much like cubes with some of the edges rounded by prism planes. Twins are common, and make the specimen appear hexagonal; identification of such twins is made by noting repeated striations on the cleavage faces. Cleavage is fairly good in planes parallel to the prism; occasionally an imperfect cleavage or parting is noted parallel to the base. Other determinative features are hardness 7 and specific gravity 2.63, both very close to quartz. The refractive indices are usually near 1.54, and the difference between greatest and least index is .008.

However, the most peculiar character of iolite is its pleochroism, which is clearly visible in all specimens. The usual color is some shade of blue, but by transmitted light the aspect may be green, yellow, brown or even colorless. Darker blues will develop when viewed in certain directions, changing perhaps to gray or wine yellow from another angle. This feature makes it impractical to facet iolite so the lapidary cuts it cabochon with the vertical crystallographic axis at right angles to the back. Good large stones are also polished as pendants which exhibit most clearly its unequalled pleochroism.

The names which have been used for iolite refer in general to the color. Dichroite, in reference to the dichroism, was once favored as the mineralogical name; cordierite, in honor of a French geologist who early described the species, is still used by European mineralogists. Jewelers have called it Lynx Sapphire and Water Sapphire from the similarity of its deeper blue shades to true sapphire. Its close resemblance to quartz after removal of crystal faces has lead to the name Blue Quartz, which has possibly been extended by the rarity of true quartz of this color. Violet Stone and Spanish Lazulite similarly connote the typical blue colors; while Ceylon Gem refers to the most important locality for gem-quality iolite.

THE SLUICE BOX

By A. RIFFLE

The saloon has often been called "The Poor Man's Club." Without getting tangled up in a prohibition argument, I simply want to say that here in the West the saloon was also oftentimes the poor man's museum. Mineral specimens that would cause any curator to pause in admiration often found place on the back bar in exchange for a few drinks or were given to some popular saloon keeper or bartender by the finder. I have seen curious rock formations, magnificent groups of crystals, splendid gem sapphires, wonderful agates, glorious native gold in quartz, gold nuggets and gold dust, and ores of various kinds, many of them worthy a place in the cases of the largest museums in the country, carelessly displayed on the back bar or in the saloon window, dusty and unlabelled. Most of these collections are now dispersed but one or two in Helena, Mont., are still intact. It was my privilege a few days ago to have a private view of the gold specimens of one of these collections. It is a lot easier to understand the fascination placer mining had for the old timers after you have "hefted" a few $50 nuggets in your hands.

"Old Bill" is nearly eighty years old but still carrying on in minor activities. I called on him New Year's Eve to help him put away the memories of the old year in a little of the proper perservative medium. He informed me that he had been approached by a newly formed mining company with the view of bonding and leasing his claims. Said "Old Bill": "It's been a long time but at last it looks like I might wind up my days taking it easy and resting on my ores."

Information of so-called "Synthetic Zircon" gems being on the market is at hand. Methods of distinguishing this material from the genuine are not known to me as yet but the old proven safeguard of purchasing from a reliable dealer will protect you.

Numerous signs point to a revival of interest in mining activities in Western Montana this spring. Prospecting of hitherto undeveloped showings and unwatering and exploration of former producers are under consideration in every district. Money for investment in the smaller enterprises seems readily available and a real feeling of optimism is noticeable. It is to be expected that such activities will bring to light some new and interesting material for the collector and student.

We start 1929 under greater obligations to the Editor than ever before because of the splendid December number of ROCKS AND MINERALS. The least we can do in return is for each of us to secure a new subscriber in 1929. Let's make it a pledge? I'll start the ball rolling by agreeing to get a new subscriber if I have to pay for the subscription myself.

Just north of the city limits of Raton, N. M., is a deposit of soft coal. In the sandstone overlying the coal veins are found some very fine impressions of large petrified palm leaves. Some of the leaves are three feet in diameter with stems two inches wide. A few leaves which resemble willow and poplar are also found.

A request received is for an article on the arrangement and display of rocks for garden and lawn purposes. We wonder if any of our readers have made a display of rocks and minerals in this manner and would they be willing to write a short description of their method for insertion in the magazine.

PALEONTOLOGY DEPARTMENT

Conducted by BENJAMIN T. DIAMOND, M.A.

Mr. Diamond will gladly assist members in identifying their fossil specimens or answering any questions pertaining to fossils. Please write to him direct, enclosing enough postage if a personal reply is desired, specimens returned, etc. Address all mail as follows: Benjamin T. Diamond, M.A., 467 Riverdale Avenue, Brooklyn, N. Y.

PELECYPODA

Perhaps the greatest number of fossils are represented by the specimens from this phylum. It is, therefore, one of the most important as well as one of the most interesting groups to study. A great number of collectors specialize only in the collection and study of the shells of the recent forms because of the great beauty offered both in color and in shape by them.

The division of these animals into five groups or classes is based entirely on the morphological differences of their shells.

Classification

Mollusca
1. *Pelecypoda*—(hatchet foot)
2. *Amphineura*—(no fossils)
3. *Gastropoda*—(stomach foot)
4. *Scaphopoda*—(very rare)
5. *Cephalopoda*—(head foot)

Characteristics of Pelecypoda

These are acephalous bivalved animals which are found only in the water. They live in the mud and are able to crawl, swim and burrow. The skeletons of these animals consist of two calcareous shells of the same size and shape fastened on the dorsal side by a ligament. In cross section the pelecypoda resembles a hatchet foot.

Some characteristics by which these shells may be recognized and particularly distinguished from the previous group, Brachiopoda (see ROCKS AND MINERALS, September, 1928) are:

Brachiopoda

1. Valves open up and down.
2. Valves unequal.
3. Beaks may have pedicle opening.
4. Teeth in one valve; if present.
5. No ligament.
6. Valves bilaterally symmetrical.

Pelecypoda

1. Valves open right and left.
2. Valves equal.
3. Beaks never have pedicle opening.
4. Teeth in both valves; if present.
5. Ligament present.
6. Valves complimentary.

The color and state of preservation of a specimen gives an immediate clue to its geologic age:

Psychozoic — Well preserved, heavy, colored and pearly.

Cenozoic—Fairly well preserved, chalky and light.

Mesozoic—Light, have lost their pearly structure (except Inoceramus simpsoni), generally found as molds in sandstones or limestones.

Palaeozoic—Dark colored, molds generally in marine shales or limestones.

Fig. 1. VENUS MERCENARIA

Fig. 2. CARDIUM TENUISTRIATUM
Fig. 3 PECTEN MADISONIUS

Fig. 4 OSTREA FALCATA
5. GIVGINERUS IDONEA
Fig. 6. NUCULA PERCRASSA

Fossil Pelecypods

Orientation

The orientation of pelecypods is effected by holding the shells with the hinge line up and horizontal with the beaks pointing away from the observer. Holding the shells in this manner the following terms are obviously defined: dorsal, ventral, anterior, right valve and left valve.

Structures

The shell is composed of three layer: 1. An innermost pearly layer; 2. A median prismatic layer; 3. An outer conchiolin layer. The prismatic layer is made up of the mineral aragonite.

The following terms are best defined by references to the figures: length, Fig. 1; width or height, Fig. 2; thickness or depth, Fig. 2; cardinal margin, Fig. 5; basal margin, Fig. 5; growth lines, Fig. 3; wings (ears), Fig. 3.

The heart-shaped flattened area in front of the beak is called Lunule, while a similar area in back of the beak is called Escutcheon. An opening in the lunule area is known as the Byssal Opening.

Articulation

The articulation of the valves is generally effected by the interlocking of teeth which are present on the hinge or cardinal margin.

Types of Teeth

Taxodont—Transverse teeth—alternation of tooth and socket. Example—ARCA.

Cardinal—Lateral teeth—series of short stout teeth.

Schizodont — Coarse variable amorphous teeth. Example—UNIO.

Teledont—Additional structures to bind valves (roughened areas).

Cyclodont — Strongly curved teeth (CARDIUM).

Anodont—Absence of teeth (ASTHENODONT).

Interior of Shell

On the inside of the shell there are some scars which are characteristic:

Pallial Line — Marking the point of attachment of mantle to shell.

Pallial Sinus—Break in attachment of mantle to shell in order to allow siphon to go through.

Muscle Scars—Anterior and posterior. The valves are opened and closed by the contraction of an elastic ligament stretched across the hinge line from valve to valve.

Types of Ligaments

Amphidetic—Extends on both sides of the beak (GLYCIMERUS).

Opisthodetic — Only behind the beak (VENUS).

Alivincular—Consists of a single elastic band extending from beak to beak (LIMA).

Multivincular — Many elastic bands stretched from beak to beak (ARCA).

Parivincular — In the form of a C spring.

Description of Some Index Pelecypods

Nucula precrassa—Well preserved internal casts with crenated margin. Cretaceous.

Glycimerus idonea—Large. Surface covered with concentric growth lines and fine radiating costae. Ligament extends on both sides of beak. Eocene.

Ostrea falcata—Shell distorted by adherence to other objects. Lower valve convex and folded with small scar of attachment. Upper valve flat. Cretaceous.

Pecten madisonius—Small unequal ears and deep byssal notch possessing a series of small teeth (ctenolium). Surface covered with stria; ribs strong, about 16 in number. Miocene.

Cardium tenulstriatum—Convex, nearly equilateral, rounded, oval. Margins of valves crenulated. Internal molds gibbous. Two cardinal teeth in each valve. Navesink.

Venus mercenaria—Valves equal, oval, concentrically striated. Margins crenulate. Three cardinal teeth in each valve. Miocene-Recent.

GENESIS OF SULPHUR

By P. WALTHER
508 Muriel Parkway, Elizabeth, N. J.

Many causes have been propounded for the origin of native sulphur. The oldest theory was that native sulphur resulted from volcanic exhalations. Then came others who claimed that all sulphur was due to oxidation of sulphuretted hydrogen. Still others offered the theory that the genesis of sulphur was due to a decomposition of gypsum, basing their conclusions on the fact that very often sulphur is found in association with gypsum.

There is no doubt that sulphur has been deposited in volcanoes and in some cases it must have been a direct sublimation; in others a reduction of sulphurous acid or an oxidation of sulphuretted hydrogen gas. The oxidation of sulphuretted hydrogen gas has now been recognized as the origin of at least the richest and best known sulphur mines of the world—as at Girgenti, Sicily.

G. von Rath, who studied the sulphur deposits at Cove Creek, Utah, has given the following description: "At Mammouth, the limestone and slate are so impregnated with sulphur that one finds lumps of over one foot in diameter consisting of pure sulphur, and small crystals cover all clefts and cavities. The limestone has been changed into gypsum. At Fort Cove Creek, the andesite is impregnated with sulphur and the bottom of the valley is covered with a crude sulphur deposit of about twenty-eight feet in thickness, of which about three-quarters of the mass represents pure sulphur. The total weight of this deposit is estimated at least 1,350,000 tons. In clefts are found sulphur crystals up to six inches in diameter. Gypsum is here everywhere, partly mixed with the sulphur; partly in big masses. Alum covers parts of the surface. The district is rich with hot and sulphuretted hydrogen springs and in some of the mines steam and sulphuretted hydrogen vapors are given off; and in the adits are found many small crystals of newly-deposited sulphur."

According to G. Specia, the case is similar in the big sulphur deposits of Sicily. Here is found in company with sulphur, Gypsum, Celestite, Aragonite, Quartz, Melanophlogite, and Opal. And as large quantities of Celestite and Quartz, are found there, Specia claims it to be impossible that the sulphur deposits were due to a decomposition of gypsum, but that the gypsum had been formed together with the aragonite by the action of sulphuretted hydrogen and hot water on limestone. Sulphuretted hydrogen in water, when strongly in excess, drives out the carbonic acid from the limestone and forms calcium sulphohydride with calcium bicarbonate, and in contact with air one gets ultimately gypsum, calcium carbonate and sulphuretted hydrogen again which is oxidized into sulphur.

In the sulphur mines of Kohiula, Daghestan, the gypsum there has been proved to be a product of the action of sulphuretted hydrogen on the limestone. The same is the case at Aix, in Savoya and near Toscana, Italy, where steam, impregnated with sulphuretted hydrogen gas, has changed the outside of limestone rocks into gypsum.

Of course in all these cases, the sulphuretted hydrogen is due in the first instance to a kind of volcanic action, even if there is no active volcano within hundreds of miles. Thus also at Aaihen and Dyardin, north of the Wansee, near Berlin, Germany.

It is a fact that certain algae and bacteria are able to separate sulphur out of gypsum solutions and that in time fairly large deposits could be formed. E. Platchard, who has made experiments in that direction, claims that all native sulphur has been deposited by the action of algae. He points out that gypsum was found nearly always with sulphur and that there was nothing improbable in his theory to claim the formation of the big sulphur deposits as due to algae, because Infusoria were able to leave after their

death the enormous deposits of Infusorial Earth and in this case the action of the algae were not due to decomposition products but to their action during life. Further, a certain kind of bacteria, the sulphur-bacteria, is able to reduce sulphates to sulphur and hydrogen sulphide by the decomposition of organisms.

Senft, in Eisenath, made artificial galena crystals by introducing decomposition gases of a dead mouse into a bottle containing a lead acetate solution whereupon galena crystals of about one-eight inch in diameter grew or developed upon a group of quartz crystals, previously placed in the bottle.

In Spain, one finds shells of Lymnaeae, Paludines, etc., filled with sulphur; and at Swoszowice, near Cracow, Poland, is found a fair sized layer of sulphur the origin of which is claimed to be due to decomposed animal matter.

Lastly, one finds sulphur on sulphides, sometimes on unchanged minerals; at other times in hollow galena crystals, as at Neuthead, Cumberland, England. Such crystals seem to be quite intact and only upon breaking them open one finds that they consist only of a thin shell of galena with small sulphur crystals on the erroded inside. How that decomposition of the galena took place can only be explained by supposing that the galena crystals had grown on Fluorite and had been covered with Fluorite; then the Fluorite was washed out from below and the bottom of the galena crystals were attacked first, by some oxidizing agent and then by reducing agents and finally the dissolved outer crust settled down on the bed of sphalerite, which had formed the support for the original fluorite.

WITH OUR CONTRIBUTORS

Aubrey E. Horn, the author of "A Brief Description of the Tin Fields of Northern Nigeria," is an official of the Naraguta (Nigeria) Tin Mines, Ltd., and his article treats not only of the tin fields but of prospecting for the metal, methods of mining, etc. The article should be of special interest to prospectors, mining engineers, and mining officials. We feel that we are very fortunate in obtaining this complete and most interesting article and we hope that Mr. Horn may find time to write us another article on the mining fields of, or minerals found in, the dark continent of Africa. This is the second article ROCKS AND MINERALS has been privileged to print upon that large but as yet undeveloped continent.

Mr. Horn in a letter to the Editor says he will be very glad to exchange specimens with any of the readers of ROCKS AND MINERALS.

Frederick H. Pough of 4 Lenox Place, St. Louis, Mo., is endeavoring to establish a clearing house for collectors. Those having good duplicates may list them with Mr. Pough to be registered and those desiring particular specimens may write inquiring of him where they may be had. All Mr. Pough asks for his services is a representative specimen for his own collection. He will be glad to furnish information to those who may write him.

Ozokerite or mineral wax is found in the United States only in Utah, in Wasatch and Utak Counties. Ozokerite, by reason of its high melting point, has several special uses for which ordinary wax obtained from petroleum would be unsuitable. It is used chiefly as a substitute for paraffin wax in the manufacture of paper to cover products, which are wrapped before cooling, such as bread; as the principal constituent in high-grade wax candles; and in polishes.

EDITORIAL

A new feature that begins with this number of ROCKS AND MINERALS is—The President's Page—and we hope to continue this in each issue. The purpose of The President's Page is to bring the members of the Rocks and Minerals Association closer together and at the same time disseminate news, ideas and other information among them. We want membership in the Rocks and Minerals Association to mean more than just an honorary membership; it should stimulate a keen interest in minerals and a desire to share this interest with others. We are hoping for the cooperation of all our members so that our aims may be realized and proper recognition be brought to the Association. Suggestions and ideas will be appreciated and may be sent to the President or to the Secretary.

Some of our advertisers have written us that minerals sent on approval to a few of our readers have not been returned promptly and remittances have been deferred long beyond the time usual in business transactions. We should like to ask the members of the Rocks and Minerals Association to be very prompt in returning minerals sent to them on approval and to forward their checks for the money due at the same time minerals are returned. We are very sure that most of our members are already doing this and we are mentioning it only because we would like to have membership in the Association mean courtesy, promptness, and honorable dealing, not only among ourselves but specially with those outside the Association.

We would like to call the attention of our readers to the special offer of two magazines for the price of one which appears in the advertising section of this issue. Among your friends or acquaintances may be one who would appreciate one or both of the magazines offered. Why not call his attention to them or better still present him with a paid subscription? He will appreciate this.

Howard Small and Ernest Mashburn, two live-wires of Riverside, Calif., have organized the S. & M. Mineral Supply House after a year and a half of collecting. They have on hand a large stock of minerals, mostly from Western localities, which they are offering at present in sets or collections but single specimens can be obtained. These young men are keenly interested in minerals, believe there is an excellent future for mineral collecting, and are ardent supporters of ROCKS AND MINERALS and the Rocks and Minerals Association. So far this year, they have obtained for the Rocks and Minerals Association four new members and we are confident that they will induce many more collectors to join the Association before the year is out. We extend to the S. & M. Supply House and to its proprietors in particular, our most sincere good wishes for a long and very successful business career. Their advertisement appears in this issue of ROCKS AND MINERALS.

Dr. Dake's contribution to the Micro-Chemical Study of the Metallic Ores and Minerals is omitted in this issue but will appear in the next. He has, however, sent in an interesting article on Ilvaite—a rare mineral that is found in Idaho.

Mr. Gunnell's contribution to Phosphorescence of Minerals is also omitted in this issue pending investigations and experiments which are necessary for the continuation of his articles. We hope to print his next installment in the June number.

It is a matter of great satisfaction to us to receive checks from subscribers for renewals to ROCKS AND MINERALS long before such renewals are due. Actions speak louder than words and it is this means of expressing their pleasure and interest in the magazine that is most encouraging to us. We feel that the magazine is not being published in vain and that many of our readers find its articles of great value and interest to them.

THE ROCKS AND MINERALS ASSOCIATION

PEEKSKILL, N. Y., U. S. A.

Organized to stimulate public interest in geology and mineralogy and to endeavor to have courses in these subjects introduced in the curricula of the public school systems; to revive a general interest in minerals and mineral collecting; to instruct beginners as to how a collection can be made and cared for; to keep an accurate and permanent record of all mineral localities and minerals found there and to print same for distribution; to encourage the search for new minerals that have not as yet been discovered; and the endeavor to secure the practical conservation of mineral localities and unusual rock formations.

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If you are not a member of the *Rocks and Minerals Association* you are invited to join.

It is our desire to enroll all mineral collectors and those interested in minerals and their study so that our purposes may be realized and the fascinating study of

minerals be increased. Dues are $1 per year in the United States and Possessions ($1.25 foreign), which includes subscription to ROCKS AND MINERALS. Dues are payable on the 1st day of January. Those joining during the year will be entitled to the full year of ROCKS AND MINERALS. Those whose subscriptions expire during the coming year, if they wish to become members of the Association, should pay for the unexpired portion of this year plus the dues for 1929.

Membership Nomination Blank

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Secretary,
Rocks and Minerals Association,
Peekskill, N. Y., U. S. A.

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(Ninety per cent of the annual dues is designated for subscription to the magazine.)

Let us all pull together and bring proper recognition to the Association.

THE PRESIDENT'S PAGE

Dr. Henry C. Dake, this year's President of the Rocks and Minerals Association, accepting his new office, says a few words to the members.—*The Editor.*

OUR AIM

The chief aim of our organization is the acquisition and dissemination of mineralogical knowledge, not only amongst ourselves, but the public as well. With this in mind I wish to make a few remarks concerning the importance of minerals.

While the majority of us study mineralogy as an avocation rather than a vocation, it behooves us, nevertheless, to learn all we can concerning our "hobby." To merely acquire a new specimen, place it in the cabinet without attempting to learn something about it is futile and a waste of time. To make the most of a mineral collection one should also collect a mineralogical library as well. Unfortunately, many of the printed references to minerals are scattered throughout numerous publications, some of which are out of print but are generally available at the larger public libraries. To assist the collector to keep in close touch with the progress made in mineralogy and the closely allied subjects, it is advised that some or all of the following publications be read regularly, in addition to text books.

Publications of the U. S. Geological Survey.

Publications of the U. S. National Museum and the Smithsonian Institution.

Publications of the American Association for the Advancement of Science.

Publications of the State bureaus of mining and geology.

Rocks and Minerals.
American Mineralogist.
Economic Geologist.
American Journal of Science.
Engineering and Mining Journal.

The books and bulletins issued by the State and Federal bureaus are sold at about cost and are well worth the charges made, and make excellent reference works.

To become well informed on the subject of mineralogy one will find that a knowledge of other sciences is quite necessary and it is urged that the collector and student of minerals do "outside" reading. The collector having a working knowledge of at least elementary chemistry will find himself better able to understand the nature of minerals and metals. Mineralogy is also closely connected with geology, mining, metallurgy, economic geology and even our very civilization is dependent upon minerals (metals) without which we could not advance or even hope to survive.

Many new advances are now being made in the utilization of new alloys having properties much superior to the metals alone. We must, therefore, continue our search for new sources of metals, not only the common ones but the rarer ones as well. We have ceased to live in the "Iron Age" and are now advancing rapidly in the "Age of Alloys." As a practical example we might consider the case of the metal beryllium (beryl) which has been known for some time but only recently isolated in sizable quantities which is typical of the progress made in metallurgy and mineralogy. It has been found that beryllium, when alloyed with certain other metals, imparts to them some very desirable qualities, which would make this alloy very useful, especially for gasoline engine pistons. However, the first problems are to find a cheaper way to extract the metal from the minerals and to locate new and larger deposits of the ores. Many examples of this kind could be cited.

Mineral collecting is a hobby and avocation, well worth our while to take seriously and to take advantage of every opportunity to add to our knowledge of it, for its cultural and practical value.

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SPECIAL INDEX TO MINERAL SPECIES

In this issue we are printing a mineral index for the first three volumes of ROCKS AND MINERALS. The purpose of the index is to make it easier for the collector to find descriptions of various minerals as published in our pages.

Much of the magazine includes very interesting reading with important notes about mineral localities or the proper care for certain unusual specimens in the mineral cabinet. Such material is often forgotten till the collector obtains a fine specimen, when he recalls the notes in part, and is at a loss to find the exact reference.

Because of the use of this index in the manner noted above, it has been thought advisable to omit from its scope the "Glossary," the occasional notes in the "Mineral Determination" columns, and the "Gem Names." These are alphabetically arranged, and can be consulted as required. All references in the general text are not included, but only those which contain data of interest to the general collector. The page reference for the rare minerals may give only a formula or similar detail, but as these minerals are comparatively little known, any information is of value to the collector.

We hope that our readers will find this index of value to them. We suggest that any criticisms be sent us immediately so that the index for Volume 4 may include everything desired by our subscribers.

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